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PATENT
0425-0846P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: Kazuyuki MATSUOKA et al. Conf.: 9781
Appl. No.: 09/942,798 Group: 3641
Filed: August 31, 2001 Examiner: FELTON, A.
For: GAS GENERANT COMPOSITION

L E T T E R

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

April 21, 2005


Sir:

This letter is further to Applicants' Amendment filed March 8, 2005. Attached, please find an executed declaration under 37 C.F.R. § 1.132 by Mr. Shogo Tomiyama. This executed declaration is to replace the unexecuted declaration submitted with the response filed March 8, 2005. Applicants respectfully submit that the claims are in condition for allowance. A Notice to such effect is earnestly solicited.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

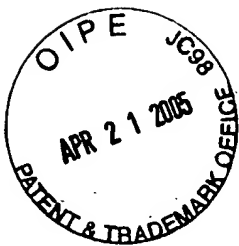
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DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

I, Mr. Shogo Tomiyama, declare the following.

I am fully knowledgeable of the disclosure of the above-identified application and the field of art of the present invention. I have read and understand the Office Action dated September 8, 2004 and the references cited therein to Highsmith et al. (U.S. Patent 5,682,014), Castagner et al. (U.S. Patent 5,160,163), Takase et al. (U.S. Patent 4,572,178), Taylor et al. (U.S. Patent 5,467,715), Plantif et al. (U.S. Patent 3,964,256) and Mitson et al. (U.S. Patent 5,518,054).

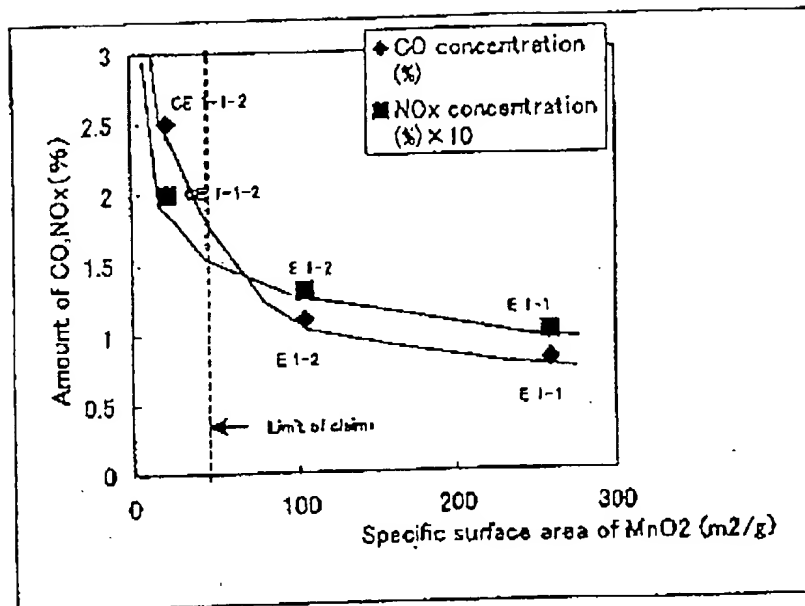
It is my opinion that the use of manganese dioxide having a specific surface area not less than 50 m²/g in (or

as part of) the gas generant composition gives the gas generant composition unexpectedly superior properties over the compositions taught by Taylor et al. and Highsmith et al.

In the outstanding Office Action, the Examiner cites Castagner et al., who teach an airbag device containing HOPCALITE, which is a mixture of copper oxide and manganese oxide, having a specific surface area of 217 m²/g as taught by Takase et al. at column 5, lines 1-5. However, Castagner et al. use the HOPCALITE in the air bag separate from the gas generant composition.

The improvements in reduction of CO and NO_x in the generated gas using manganese dioxide having a specific surface area not less than 50 m²/g in (or as part of) the gas generant composition can be seen in the following table and graph which contains data obtained from the present specification:

	Comparative Example 1-1-2	Inventive Example 1-2	Inventive Example 1-1
Specific Surface Area of MnO ₂ (m ² /g)	21.5	104	260
CO concentration (%)	2.5	1.1	0.8
NO _x concentration (%)	2000	1300	1000

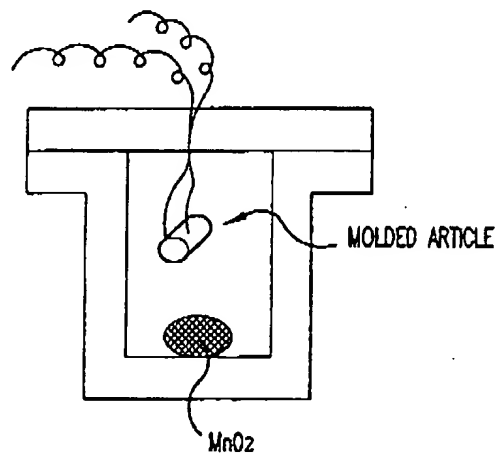


The gas generant composition of Inventive Example 1-2 having a specific surface area of MnO₂ of 104 m²/g shows a 56% reduction in CO detected in the generated gas over the gas generant composition of Comparative Example 1-1-2. Also, the reduction in NO_x detected in the generated gas is 35%. There are even higher levels of improvement when comparing the gas generant composition of Inventive Example 1-1 with the gas generant composition of Comparative Example 1-1-2.

I now describe the results of experiments, which were performed by me or under my direct supervision, which show

that the improvements are even greater when the above-described experiments are performed by keeping the MnO_2 in the air bag separate from the gas generant composition as taught by Castagner et al.

The tests were carried out by burning molded articles of 5 gas generating agents in a vessel as shown the photograph which is attached hereto as an appendix, and not in an inflator. A basic description of the configuration of the vessel is shown in the figure below with respect to Samples (3)-(5).



The 5 gas generating agents are described in the following table.

Sample	Used material	Configuration	CO (ppm)
(1)	5AT/GN/NaNO ₃ /CuO	blank - no MnO ₂	130
(2)	5AT/GN/NaNO ₃ /CuO/MnO ₂	MnO ₂ kneaded in	113
(3)	5AT/GN/NaNO ₃ /CuO, MnO ₂	MnO ₂ placed aside	130
(4)	5AT/GN/NaNO ₃ /CuO, MnO ₂	MnO ₂ placed aside	120
(5)	5AT/GN/NaNO ₃ /CuO, MnO ₂	MnO ₂ placed aside	130

5AT is 5-amino-tetrazole. GN is guanidine nitrate.

The vessel is a one liter stainless steel vessel, wherein the above described materials were molded into a molded article. The molded article weighed about 2 g, and had a diameter of 9.6 mm. It was suspended with nichrome wire.

In Sample (2), the MnO₂ is kneaded directly into the molded article and this configuration is considered to be very similar to the actual inflator of the present invention.

In Samples (3), (4) and (5), MnO₂ was laid on the bottom wall of the vessel separate from the molded article composition.

The composition of Sample (2) includes 16.42 parts by weight of 5AT, 11.64 parts of GN, 1.46 parts of NaNO_3 , 68.98 parts of CuO and 1.50 parts of MnO_2 . The MnO_2 was kneaded into the composition.

The composition of Samples (1), (3), (4) and (5) contain 16.67 parts by weight of 5AT, 11.82 parts of GN, 1.48 parts of NaNO_3 and 70.03 parts of CuO .

For Samples (3), (4) and (5), 1.5, 3 and 500 parts by weight of MnO_2 , respectively were used as the fuel catalyst, with the MnO_2 being placed nearly out of the tested inflator. The term "nearly out of the tested inflator" is now explained. In this configuration, the MnO_2 is considered to be located in a very similar placement when compared to a bag.

An electric current was applied to the nichrome wire to burn the article. After one minute, gas was sampled with a gas-recovery bag. The gas was analyzed with a gas detector tube, manufactured by GasTech Co., Ltd., to determine the concentration of carbon monoxide, and the results are shown in the above-table.

Sample (1) is equivalent to the showing of the Taylor reference. Sample (2) falls within the scope of the presently claimed invention, which is a kneaded mixture of the gas generating agent and MnO_2 as a catalyst. Samples

(3) - (5) are equivalent to the showing of the Castagner reference.

It is noted from the test results that Sample (2) is superior to Sample (1) in view of reduction of CO. Sample (3) is equal to Sample (1) in reduction of CO, in that no reduction effect was seen. Samples (3), (4) and (5) are inferior to Sample (2) in the reduction of CO. Also Samples (3), (4) and (5) showed that there is no relationship between amount of MnO_2 and CO absorption when MnO_2 is not kneaded in the composition. No effect is seen with such a large amount of MnO_2 present in Sample (5).

Accordingly, the present invention is not made obvious over the cited references, since these results would be unexpected based on the teachings of the cited references. No combination of the cited references teaches or fairly suggests that the presence of the manganese dioxide having a specific surface area not less than $50 \text{ m}^2/\text{g}$ in (or as part of) the gas generant composition gives the gas generant composition such superior properties to the configuration where the same components are used except that MnO_2 is not an intimate part of the composition.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further

that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

A handwritten signature in dark ink, appearing to read "Shiro Miyama", is written over a horizontal line.

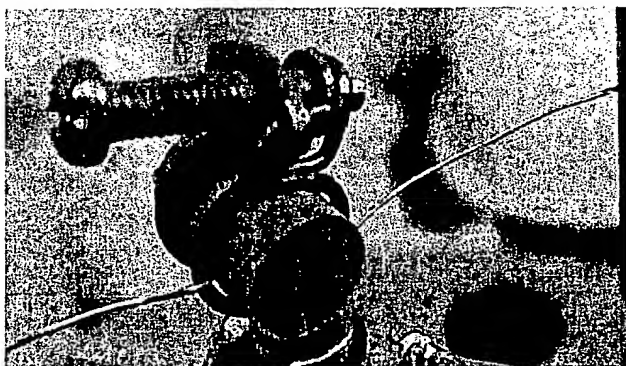
Signature

April 15, 2005

Date



SERIAL NO: 09/942,798



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